Maxillofacial Surgery Basics for the Dental Team: Part II

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Continuing Education Units: 4 hours

Oral and maxillofacial surgery (OMS) is one of the oldest dental specialties. It is the branch of dentistry that encompasses the diagnosis and surgical treatment of diseases, injuries, and defects of the oral and maxillofacial region. This continuing education course outlines the basic principles involved in the extraction of teeth, armamentarium needed, indications for extractions, classifications and management of third molar extractions, preoperative and postoperative management of the surgical patient, and possible complications following treatment.

Conflict of Interest Disclosure Statement
• The author reports no conflicts of interest associated with this course.

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Overview
Oral and maxillofacial surgery (OMS) is one of the oldest dental specialties. It is the branch of dentistry that encompasses the diagnosis and surgical treatment of diseases, injuries, and defects of the oral and maxillofacial region. Oral and maxillofacial specialists work with general dentists, physicians, and other dental specialists in the total treatment of a dental patient. Although many individuals commonly associate an oral surgeon with the practice of extracting teeth for dentures or with the removal of third molars, such
procedures are only a small part of the total responsibility of this specialty. For instance, an oral maxillofacial surgeon may treat a patient who has been severely injured in an accident, resetting the mandibular jaw and working closely with an orthodontist and perhaps even a plastic surgeon to restore the patient’s normal oral function. Other aspects of oral surgery involve implantology and facial cosmetic surgery.

Oral and maxillofacial procedures may be practiced in the general dentistry practice, but not to the same extent of a specialty practice. Some general practitioners have completed advanced training in surgical techniques such as conscious sedation and utilize this training in a general practice setting.

This course outlines the basic principles involved in the extraction of teeth, armamentarium needed, indications for extractions, classifications and management of third molars extractions, preoperative and postoperative management of the surgical patient, and possible complications following treatment.

**Learning Objectives**

Upon completion of this course, the dental professional should be able to:

- Discuss the reasons for tooth removal.
- Identify the appropriate forceps required for specific teeth.
- Discuss and identify surgical instruments and their functions.
- Understand basic surgical techniques.
- Discuss the management of third molars and their classifications.
- Demonstrate the proper method of disposing of regulated medical waste.
- Discuss the postoperative management instructions for surgical patients.
- Recognize postoperative complications.

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Glossary
acute – Having a rapid onset, severe symptoms, and a short course; not chronic.

adverse sequelae – Undesired side effects following a procedure.

alveectomy – Surgical removal of all or part of the alveolar process in the mandible or maxilla, often done in the treatment of neoplasms.

alveolar mucosa – Soft tissue surrounding the alveolar bone.

alveoplasty – Reshaping of the alveolar bone.

anaerobic – Able to live without oxygen.

bifurcation – The anatomical area where roots divide in a two-rooted tooth.

biopsy – Obtaining a representative tissue sample for microscopic examination, usually to establish a diagnosis.

buccal – The tooth surface adjacent to the cheeks on posterior teeth.

calciﬁed – Hardened tissue.

caries – Gradual decay and disintegration of soft or bony tissue of a tooth; allowed to progress, it may lead to an abscess.

cellulitis – Inflammation of cellular or connective tissue; a localized infection in the skin.

cementum – A thin layer of calcified tissue covering the root.

circumdental – Around a tooth.

dentigerous cyst – A cyst containing teeth.
diastema – A space between two adjacent teeth.
diffuse – Scattering or spreading; not concentrated.
distal – The tooth surface farthest from the midline of the arch.
elevator – Dental surgical instrument of varying design for extracting teeth, removing bone fragments or roots, or for separating tissue from the bone.
erupted – (dentition) Having emerged through the gingiva.
erythematous – Diffuse redness.
exodontia – Extraction of teeth.
exudate – Accumulation of ﬂuid or pus that slowly discharges from a tissue or opening.
fascia – Connective tissue covering or binding together body structures.
fibrous connective tissue – Connective tissue made up of ﬁbers that hold things together.
forceps – Instrument resembling a pair of pincers or tongs, used for grasping, manipulating, or extracting teeth; available in various shapes.
free gingiva – The unattached portion of the gingiva that forms part of the wall of the sulcus surrounding the anatomical crown of a tooth.
frenectomy – Surgical cutting of the frenum.
frenum – A fold of mucous membrane that connects two parts (such as the tongue to the floor of the oral cavity), and limits the movement of one of the parts.
fulminating – Having a severe and rapid onset.
gingiva – The tissue that covers the necks of the teeth and the alveolar processes of the maxilla and mandible; the gum.

gutta percha – A filling material placed in the root canals during endodontic treatment.

hematologic neoplasms – An abnormal formation of tissue and blood, visible through the skin.

hyperbaric oxygen therapy – Treatment using oxygen under high pressure to prevent bacterial infection.

impacted – Tightly wedged in an area or position.

intraoperative – During a surgical procedure.

junctional epithelium – The zone of gingiva attached to the tooth.

keratinized – Tissue that has become hard.

keratocyst – A cyst containing keratin.

labial – The tooth surface adjacent to the lips on anterior teeth.

lingual – The tooth surface adjacent to the tongue.

lymphadenopathy – Abnormal enlargement of the lymph nodes.

malposed – Abnormal or faulty position.

mandibular – Pertaining to the lower jaw.

maxillary – Pertaining to the upper jaw.

mesial – The tooth surface closest to the midline of the arch.

morphology – Study of structure and form without regard to function; also refers to the form and structure of an organism or any of its parts.

nonresorbable – Does not dissolve; is not broken down by the body.

odontogenic – Referring to the origin and formation of teeth.

osteomyelitis – Inflammation of the bone, especially the marrow, caused by a pathogenic organism.

osteoplasty – Surgical bone repair or recontouring.

osteoradionecrosis – Death of bone following radiation.

palatal – Pertaining to the roof of the mouth.

palpate – To examine by touch.

pathogenic – Capable of producing disease.

pericoronitis – Inflammation of the gingiva about the crown of a partially erupted tooth.

platelet – Type of blood cell that aids in coagulation.

postirradiation – Following radiation therapy.

preirradiation – Before radiation therapy.

radiotherapy – Treatment of disease with radiation, especially by selective irradiation with x-rays or other ionizing radiation.

rampant decay – Sudden onset of widespread caries that penetrates quickly to the dentinal pulp.

ridge – An elongated projection or crest of bone.

succedaneous – Replacing, or supplying the place of something else; describes secondary or permanent teeth (which replace the primary teeth).

sulcus – The space between the free gingiva and the tooth.

symptomatic – Exhibiting a symptom.

systemic – Pertaining to the whole body.

tannin – A component in tea that can aid in the formation of blood clots.

trismus – Painful contractions of the chewing muscles, often associated with an oral infection.
unexposed – Buried or unerupted.

white blood cell – Cell normally present in the blood that aids in tissue repair, immune response, and inflammatory response.

**Indications for Extraction**
The extraction of teeth is one of the oldest dental procedures and one of the most frequently performed procedures in an oral and maxillofacial surgery office. Indications for tooth extraction include advanced periodontal disease, abscess, excessive caries, failed endodontic treatment, and third-molar impaction. Extraction also may be part of an orthodontic or prosthodontic treatment plan. Moreover, it is not uncommon for patients with cancer undergoing radiation therapy to have potentially problematic teeth extracted. Retained roots also may require surgical removal.

**Advanced Periodontal Disease**
A tooth that is severely periodontally involved may require an extraction. At the dentogingival junction, the gingiva attaches to underlying calcified tooth structure by a specialized layer of cells referred to as the junctional epithelium. The mucogingival line marks the junction between the attached gingiva, which is keratinized tissue, and the free, nonkeratinized alveolar mucosa. A normal and healthy tooth has attached gingiva that fits snugly against the tooth (Figure 1). As periodontal disease progresses, the connective tissue fibers and gingiva is destroyed, allowing the tooth to become mobile.

Between the attached gingiva and alveolar bone, connective tissue fibers connect and anchor the gingiva to the alveolar bone and the cementum of the tooth. If not properly cleaned, these areas can become inflamed and infected with bacteria from plaque and debris accumulation. The range of inflammation varies from mild gingivitis to severe periodontitis. The more advanced the disease, the deeper the pockets in the sulcus and the farther away the attached gingiva is located.

Frenectomies of the inferior labial frenum may be necessary if the frenum is causing a mucogingival problem in the mandibular anterior region.

**Extraction as Part of an Orthodontic Treatment Plan**
Other dental specialists such as orthodontists often work in conjunction with general dentists and oral surgeons to complete an orthodontic treatment plan. The orthodontist may require unexposed teeth to be surgically exposed and left to erupt naturally, or they may need to be aided and directed into position by orthodontic means. Other cases may involve the extraction of permanent premolars or incisors, or even retained primary teeth, to assist with spacing prior to orthodontic treatment. Occasionally, poorly positioned permanent teeth may need to be extracted as part of the orthodontic treatment plan.

Orthodontists also may request a frenectomy to facilitate treatment. A very prominent labial frenum between the maxillary central incisors can

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**Figure 1. Attached Gingiva Representation**
contribute to an unsightly diastema (gap) between the teeth.

**Extraction as Part of a Prosthetic Treatment Plan**
Before the fabrication of full or partial dentures, protruding or sharp areas of bone that form the denture-bearing ridges may need to be surgically smoothed or trimmed to allow fabrication of well-fitting, stable, and comfortable dentures. Such a procedure is called ridge trimming or alveoplasty. When a plate of alveolar bone must be removed, the procedure is referred to as an alveolectomy.

A prominent frenum also may need to be removed to allow effective toothbrushing or construction of a maxillary denture.

**Dental Abscess and Cellulitis**
Infection of the teeth or other surrounding oral structures may present as a cellulitis or as an abscess. Cellulitis is a diffuse, hard, erythematous swelling resulting in the spread of microorganisms through the soft-tissue fascia. An abscess is a localized cavity lined by fibrous connective tissue that contains exudate. Antibiotics are frequently used to treat cellulitis; abscesses may be treated by surgical intervention.

Two types of abscesses involve the teeth: endodontic and periodontal. Root canal therapy treats endodontic abscesses by removing diseased nerve tissue and replacing it with a purified material called gutta-percha. Occasionally, a dental patient may opt to have the infected tooth extracted rather than undergo endodontic treatment. Periodontal abscesses involve the alveolus of the teeth and the tissues holding the teeth in place. These abscesses may be treated with extraction of the tooth involved.

**Excessive Caries - Where Conservation is Not Possible**
If caries-infected teeth are left untreated, pain and increased numbers of bacteria in the oral cavity result. When rampant caries is present and no restorative treatment is acceptable, teeth are extracted.

**Failed Endodontic Treatment**
When endodontic treatment options fail, the next course of action is usually extraction. An inadequately sealed root canal may result in a recurrent apical or periodontal infection, which may not be able to be treated successfully.

**Preirradiation/Postirradiation Extractions**
Teeth may be treatment-planned for extraction prior to or after radiotherapy in patients being treated for cancer. Patients who are scheduled for radiotherapy should be sent to a dentist for screening and treatment before radiotherapy begins. Teeth with a questionable or poor prognosis often are extracted, leaving intact only those teeth with a healthy periodontium. Extractions are typically performed at least three weeks before starting radiotherapy to ensure soft tissue healing. Primary soft tissue closure is generally recommended, even if it means removing extra bone. A custom fluoride tray often is fabricated for the remaining teeth, and self-administered topical fluoride treatments are usually prescribed.

The postirradiation patient who requires extraction poses a difficult clinical dilemma. Because of the decreased blood supply in the involved jaw structures, the incidence of post-extraction osteoradionecrosis in this population is elevated. When an extraction on these patients is necessary, it is often performed in a specialty office or hospital setting, and the patients are often placed on systemic antibiotics prior to and following the extractions. In some cases, hyperbaric oxygen therapy is given before surgery and postoperatively.

Patients scheduled to undergo chemotherapy may be treated similarly to preirradiation patients. Post-chemotherapy, patients usually are cleared to undergo surgical procedures three weeks after the last cancer treatment, provided they have suffered no hematologic neoplasms. The patient’s white blood cell count should be at least 2000/mm$^3$, with a platelet count of 50,000/mm$^3$ before undergoing routine procedures.

**Extraction of Impacted Third Molars**
Permanent third molars, commonly referred to as wisdom teeth, are the last to erupt in the oral cavity and usually do so between ages 17 and 21, when jaw growth is complete. These teeth may have insufficient space to erupt completely, and frequently, an erupting third molar meets the
distal surface of the second molar and becomes lodged or impacted. The distal cusps of the tilted tooth are often exposed to the oral environment, where bacteria and infection can spread beneath the gingival tissue into the bony space occupied by the impacted tooth. This resulting pain and swelling is called pericoronitis. To prevent recurrences of this condition, most impacted teeth are extracted surgically. Surgical removal of painfully infected teeth or roots should be delayed until acute infection is controlled with antibiotics, otherwise a serious form of spreading bone infection (osteomyelitis) may result.

Retained Roots
During the removal of a tooth with forceps, there is the possibility of a root tip fracturing and remaining in the alveolus. Similarly, teeth that have had their crowns completely destroyed (for example, by caries) or their clinical crowns fractured off due to trauma, should have the root tips surgically extracted.

Methods of Tooth Extraction
Teeth can be extracted in two ways. The standard method involves the use of an elevator and forceps. The elevator is inserted between the tooth and periodontal ligament and the tooth is gently loosened or elevated out of the alveolus. Forceps then are used to grasp and extract the tooth from the socket.

The second method of tooth removal is to section the tooth in the alveolus and extract it in pieces. This method is commonly used for impacted third molars or wisdom teeth, or for tooth fragments that are retained or buried in the alveolar bone. The site is surgically exposed using a hand chisel and mallet or a handpiece. The tooth then is extracted using a combination of elevators and forceps.

Instrumentation
A variety of different instruments are used in oral surgery. Many are made from stainless surgical steel, which is strong enough to withstand both the forces applied during oral surgery and the heat processes required for proper sterilization following the procedure.

Surgical Forceps
One of the most routinely used oral surgery instruments is the surgical forceps (Figure 2), which are available in many different styles for various uses. The proper forceps for a surgical task fits comfortably in the dentist’s hand, adapts well to the contours of the tooth to be extracted, and applies force along the long axis of the tooth. The dentist uses forceps to luxate the tooth (rocking it back and forth from buccal to lingual) from the alveolus. This technique widens the alveolus, making the tooth easier to lift out.

Forceps have three parts:
1. the beaks, which should be sharp to facilitate placement on the tooth or roots;
2. the hinge, which should move freely but not be worn or loose; and
3. the handles, which are serrated and available in a variety of designs to provide the dentist with a firm handhold that prevents slipping during use.

The beaks of the forceps are manufactured in a variety of sizes (“gauges”) to allow their size to be matched to the tooth mass they will be gripping. Large beaks are termed “heavy gauge” (Figure 3), while narrow beaks are referred to as “fine gauge” (Figure 4). Beaks may also be serrated.

All dentists have their own preference of forceps that works best for them, and specific teeth
For maxillary premolars, the handles of the forceps need to be curved so the instrument can span the mandible and allow the simple beaks to be correctly placed. This type of forceps is called ‘Reade’s’ forceps (Figure 5). The #286 bayonet forceps is designed for removal of the premolar and single roots. The #65 forceps is a narrower version of this instrument and is used for root tip removal.

Maxillary molars, viewed from the buccal side, exhibit two roots, but on the palatal side there is a third root. The beak design takes into account the root surface difference in the maxillary teeth, so instruments are designated “right” (labeled “R”) and “left” (labeled “L”). The handles are curved so that as the beaks are placed towards the molar region, the handles span the mandible and teeth. The #53 R and #53 L and the maxillary cowhorn forceps #88 R and #88 L (Figures 6 & 7) are bayonet forceps commonly used for these teeth.

Mandibular Forceps
Mandibular anterior teeth are often extracted with the same type of forceps, which has a simple beak to grip the single root mass of these
the instrument is popularly used as a straight elevator for removing roots or for driving into the periodontal ligament to expand the bony socket. This assists in the placement of forceps prior to tooth removal.

Warwick James’ elevators have a slim shaft and a beak with a rounded end. The beak may be in line with the shaft or curved to one side. This elevator is manufactured in sets of three: straight (Figure 11), as well as left and right curved.

Cryer’s elevators have a sharp, pointed triangular beak set at a right angle to face either the left or right side of the shaft (Figure 12). The shaft of the elevator is also angled so that it clears the buccal tissues when in use. These elevators are particularly useful in removing lower molar roots, but they also function elsewhere. Winter’s elevators are similar to Cryer’s, but with a T-shaped handle. They are no longer in common use because of the dangerous force they can generate because of their handle design.

The periosteal elevator (Figure 13) is used to reflect, pull away, or detach and lift the tissue and periosteum from the bone. Most periosteal teeth. The beaks of the instrument are set at right angles to its handles (Figure 8). Teeth are gently rotated back and forth to loosen the tooth from the alveolus. Mandibular molars viewed from the side have two root faces, a distal and a mesial. Mandibular molar forceps (Figure 9) have beaks that are designed to grip both roots simultaneously, with the ends of the forceps appearing pointed. The point fits into the bifurcation between the roots. One forceps is universal and can be used on either side.

**Elevators**

Elevators are used to break the periodontal ligament, which loosens the tooth, and to extract roots or impacted teeth from their sockets when the use of forceps may be cumbersome. The workhorse of the surgical extraction tray, surgical elevators come in many types, each usually named for the surgeon who originally designed it. Three of the most common elevators are the:

- Coupland’s gauge
- Warwick James’ elevator
- Cryer’s elevator

**Coupland’s gauge** (Figure 10) is not actually an elevator but a bone chisel. Nonetheless, the instrument is popularly used as a straight elevator for removing roots or for driving into the periodontal ligament to expand the bony socket. This assists in the placement of forceps prior to tooth removal.

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blood vessels, while needle holders are used to hold suture needles. Hemostats can be curved or straight; needle holders are generally straight. Hemostats are usually narrower than needle holders, which are more blunted and heavier. Also, the serrated portion of the beaks are longer on a hemostat than on a needle holder. Many needle holders have a serrated pattern on the internal portion of the beak or a slotted groove down the midline of the beak to allow space to hold the suture needle.

Retractors are used to hold tissue and to keep the cheek and lips away from the working field. Available in a variety of sizes and shapes, retractor can be made out of disposable plastic or sterilizable metal.

Root tip picks are utilized to remove root tip fragments from the socket. They are supplied in a variety of sizes and shapes (Figure 16).

A bone rongeur is used to remove and contour excess alveolar bone from around the site of an extracted tooth. Rongeurs look like forceps, but the handle is often spring-loaded (Figure 17). The sharp edges of the beak can snip away sharp edges of bone. These instruments are frequently used to prepare the alveolar ridge for dentures after extractions. Bone files are used after the rongeurs to further smooth the edges of the alveolar ridge. Most bone files (Figure 18) are double-ended and usually are a different size on each end of the file.

Common to most surgical set-ups, a scalpel is a thin, sharp blade used to make a cut or incision. Most dentists opt for reusable (sterilizable) scalpel handles, but the sterile scalpel blades are always
The water used as coolant must be sterile saline or sterile water. Surgical high-velocity evacuation (HVE) tubing is lightweight, flexible, and sterilizable. Most surgical HVE tips are made of metal or disposable plastic. Available in a variety of shapes and sizes, the tips have a small opening that reaches deep into the socket.

Surgical scissors are used routinely in oral surgery to cut sutures, undermine tissue, and separate tissue from other tissue. At times the scissors may be used in place of the scalpel blade to trim tissue. Surgical scissors (Figure 21) are made of stainless steel and available in lengths of four to seven inches with tips that are blunt, sharp, curved, straight, or a combination of these.

Surgical curettes are used to clear the alveolus of tissue fragments and infected material, such as the exudate from an abscess. These curettes (Figure 20) are double-ended and have a round tip that can scoop material out of the alveolus. The ends are polished steel and range in size from very small to large.

Mouth Props (also called bite blocks) keep the patient’s mouth open. They come in a variety of designs and sizes.

Tissue retractors are used to retract the cheek, lip, and tongue from the surgical field.

A surgical handpiece is used to remove bone from the working field.

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Tissue pliers and forceps are used to hold tissue during surgical procedures and while suturing. Tissue pliers are similar to cotton pliers and typically are very fine instruments. They have small teeth on the ends to aid in holding the tissue. These pliers are designed to hold larger portions of tissue, making them especially suitable for biopsies. Some have locking handles.
socket prior to forceps use. If no tooth mobility is seen after various attempts at forceps extraction, a surgical extraction is usually performed. The degree of postoperative pain, swelling, and discomfort correlate to the amount of trauma received during the extraction procedure.

**Forceps Extraction Techniques and Principles**
Regardless of the tooth to be extracted, some common principles can be applied to all dental extractions. Before engaging the tooth with the appropriate forceps, a periosteal elevator is used in an atraumatic fashion to gently free the gingival cuff and interdental papillae to permit positioning of the forceps’ beaks in an apical direction. After the forceps have been positioned beneath the soft tissue cuff, a strong apical seating force is applied. This helps to significantly increase the mechanical advantage. When the forceps are seated, the handles are squeezed together to engage the tooth. The dentist’s free hand is positioned to stabilize the alveolus with the tooth, allowing the dentist to feel if the alveolus is moving with the tooth. If so, technique must be altered and a surgical extraction should be considered before causing any serious problems to the surrounding bone.

Forces generated during forceps extraction are applied in both an apical and a buccal-lingual direction. The apical force works to break the periodontal ligament attachment; the lateral force expands the alveolus. This technique is slightly modified when maxillary molars are extracted. In such cases, more buccal than palatal forces are used (should a root fracture occur, it is easier to surgically retrieve a fractured buccal maxillary root than a fractured palatal or lingual root). The opposite is true when maxillary first premolars are extracted for orthodontic reasons. If the buccal plate of bone is removed during attempted root retrieval, future planned orthodontic movements can be detrimentally affected.

During all procedures, forces are applied in a slow and calculated manner to permit expansion of the alveolus. Swift, jerky movements of either the elevators or forceps are more likely to lead to fracturing of the teeth and associated bony alveolar fractures. Rotational forces are applied during the extraction of teeth with single conical roots (for example, maxillary canines and incisors

**Basic Surgical Techniques**
Many factors are involved in obtaining the best visibility and access for extractions. Proper lighting and retraction must be available, and patient positioning is crucial to the comfort of the dental team. The dental team members may be responsible for patient positioning, light accessibility, and retraction, which is commonly provided using the Minnesota retractor or mouth mirror.

**Patient Positioning**
The patient’s head should be positioned in the dental chair or on the surgical table to provide maximum comfort and control during the procedure. For maxillary procedures, position the chair so that the maxillary occlusal plane is 60 to 90 degrees to the floor. When using a surgical table, position the head with the maxillary arch perpendicular to the floor. In both instances, the dentist is positioned in front of the patient.

Mandibular procedures are best performed with the occlusal plane parallel to the floor.

**Forceps vs. Surgical Forceps**
The cervical gingiva is reflected to expose the crestal bone and most teeth are luxated in their Figure 21. Surgical Scissors
Reprinted with permission from Hu-Friedy, Instruments.
and mandibular canine teeth). When routine exodontia cannot be accomplished during the procedure, or if the clinical crown has fractured off during the attempted extraction, a surgical technique must be used.

**Extraction Techniques**

As a surgical dental team member working in a specialty practice or in a general practice, both should be familiar with the most commonly used forceps for removing specific teeth.

**Maxillary Molars**

The maxillary universal forceps #150 is used for most maxillary molars, whereas more difficult

**Extraction Techniques**

As a surgical dental team member working in a specialty practice or in a general practice, both should be familiar with the most commonly used forceps for removing specific teeth.

**Maxillary Incisors and Canines**

In the extraction of maxillary incisors and canines, the labial and palatal gingival cuff is gently reflected with a periosteal elevator. A straight elevator then is used to develop some mobility of the tooth. A #1 straight maxillary forceps is placed on the crown, and controlled force is used to seat the beaks of the instrument on the neck of the tooth. The forceps is seated as apically as possible. Cautious labial and palatal pressure is applied, similar to a pendulum, along with a gentle rotation until the tooth is free of the alveolus (Figure 22).

**Mandibular Incisors and Canines**

Mandibular incisors and canines are similar in shape to one another, although the incisors are shorter, thinner, and more likely to fracture during an extraction. The mandibular universal forceps #151 (Figure 23) is generally used to extract these teeth. The beaks are firmly seated, then short labial and lingual luxating (Figure 24) movements are performed until the teeth are extracted in a labial direction.

**Maxillary Premolars**

The maxillary universal forceps #150 (Figure 25) is used in the extraction of maxillary premolars. After some mobility is obtained using a straight elevator the forceps is seated along the long axis of the tooth (see Figure 14). Gentle buccal and palatal movement is obtained, followed by sustained apical pulling force (Figure 26).

The first premolar often has two fine roots. Because the palatal root is the harder of the two roots to recover, a buccal delivery of this tooth is best performed.

**Mandibular Premolars**

Mandibular premolars tend to have conical root shapes and are usually extracted using buccal and lingual movements with the mandibular universal forceps #151. The tooth is delivered buccally.

**Maxillary Molars**

The maxillary universal forceps #150 is used for most maxillary molars, whereas more difficult
Mandibular Molars
Mandibular molars are two-rooted teeth, often with divergent roots. The lower universal forceps #151 is often used for their extraction. The mandibular molar cowhorn forceps #23 (Figure 27) is more helpful when extracting difficult molars. This forceps has sharp buccal and lingual beaks that slide between the mesial and distal roots. As the instrument is engaged firmly between the roots, a gentle pumping action forces the tooth superiorly out of the socket.

Multiple Tooth Extractions
When the extraction of multiple teeth is planned, some common guidelines are usually followed. Maxillary teeth are generally extracted first because the onset of local anesthesia is usually quicker than in the mandible. The most posterior teeth are typically extracted first. Following multiple extractions, the overlying mucosa is replaced, and the bony ridge is palpated for obvious ridges or severe undercuts (The bony ridge and alveolar bone should be conserved to provide better bone contour and possibly permit later implant placement.). If ridges or undercuts

molar teeth are extracted using the maxillary cowhorn forceps #88 R (as seen previously in Figure 6) or #88 L (as seen previously in Figure 7). After mobility is attempted with a straight elevator, the forceps is seated and buccal and palatal forces are applied, using predominantly buccally directed force. If mobility is limited, the tooth is often surgically extracted by sectioning the buccal root from the palatal root. A straight elevator then splits the tooth, delivering each root fragment separately.
exist, osteoplasty is performed with a bone rongeur; bone files are used to smooth the edges of the alveolar ridge. The site then is irrigated with sterile water and the mucosal tissue is replaced and closed with sutures.

**Deciduous Teeth**

Extraction of deciduous teeth follows all of the basic principles for adult permanent exodontia. Of course, the forceps used for primary teeth is smaller. Also, because of significant divergence of the roots found in nonresorbed deciduous molar teeth, early consideration is given to sectioning the teeth and performing individual root retrievals. The dentist must always keep in mind the close proximity of the deciduous tooth to the succedaneous permanent tooth and use care to avoid damage. If a root fracture occurs, attempts should be made to surgically retrieve any residual root (provided it will cause no permanent injury to the permanent tooth). Most often no adverse sequelae result from allowing residual roots to remain, and a decision may be made to forego retrieving them. However, the patient’s guardian or parent should always be informed of all potential consequences, and the conversation should be noted in the chart.

**Surgical Techniques**

Surgical exodontia involves the reflection of a full-thickness mucoperiosteal flap and exposure of the underlying bone with possible bone removal. The design of the flap can vary, but all flaps are based on common surgical principles.

An incision is made with a #15 scalpel blade on a #3 handle over a site that is not planned for removal. The incision should be made away from vital structures such as the mental nerve and foramen and the lingual nerve. Flaps are made the full thickness of the underlying periosteum and should allow clear and adequate hard-tissue visualization. This eliminates the potential for tearing of soft tissue and facilitates bone removal. The actual soft tissue design is commonly one of two basic designs: the envelope flap or the three-cornered flap.

**Flap Design**

To make the envelope flap, the dentist uses a scalpel to circumdentally incise the fibers around the involved tooth as well as one tooth on either side. A sharp periosteal elevator then is used to lift the involved dental papillae, gently reflecting a full thickness of the mucoperiosteal flap. Care must be used to avoid placing unnecessary pressure on the flap, which can cause it to tear. If additional access and visualization is needed, a vertical incision also may be made into the flap, changing it into a three-cornered flap (the other most common basic flap design). Occasionally two vertical incisions are used to create a four-cornered flap.

Once an adequate flap has been reflected, the dentist can better determine the next step in the surgical procedure. If enough tooth structure remains, the dentist may attempt to reseat the forceps and extract the tooth without removing bone.

In cases where little tooth structure remains, a portion of the buccal bone needs to be removed. With a bur, a surgical handpiece, and sterile water as a coolant, bone is carefully removed to approximately one-half of the root length. Since the surgical handpiece does not spray water, the dental team member must carefully administer sterile water to the surgical site via syringe, at the same time suctioning the surgical field (Sterile water must be used to prevent introduction of contaminants into the surgical site.). Once the buccal bone has been removed, the dentist can use either a straight elevator or forceps to extract the remaining tooth structure. In multi-rooted teeth, the individual roots are sectioned, divided, and then extracted separately. The surgical site is irrigated and the bone edges are smoothed with a bone file. Finally, the mucoperiosteal flap is repositioned and the flap is closed. Interrupted 3-0 or 4-0 black silk sutures are routinely used to reposition the interdental papillae and flap.

**Bone Grafting**

Bone grafting is a procedure that replaces or augments the bone that surrounds the teeth. When a tooth is extracted, the surrounding bone may collapse. To preserve the existing bone for esthetic purposes or a future implant scenario, bone grafting material can be placed into the empty tooth socket. The materials that exist for grafting are autogenous, allograft, and xenograft. Autogenous material is from bone taken from a different area of the patient. Allograft material
is either synthetic bone or bone attained from a bone bank (cadaver bone). Xenograft material is bovine/cow bone. After several months of healing, implant work can begin or prosthetics can be fitted to restore function and esthetics.

**Suture Materials**

There are two basic types of suture material available:

1. Resorbable sutures made of a material that is broken down by the body.
2. Nonresorbable sutures that must be removed.

Both are used in the oral cavity. Resorbable sutures are most commonly made of gut, polyglycolic acid, or polygalactic acids. Plain gut sutures retain their strength for approximately five to seven days, whereas chromic-treated catgut retains its strength slightly longer (nine to 14 days). Polygalactic and polyglycolic acid sutures may take up to four weeks to resorb.

Nonresorbable sutures may be made from silk, nylon, polyester, or polypropylene, with silk 3-0 or 4-0 being the most commonly used in the oral cavity. Whether resorbable or nonresorbable sutures are used, they are often removed within a week when the patient returns to the clinic for a follow up visit. In some states, suture removal can be legally delegated as an expanded function to dental team members. Check the current state’s *Dental Practice Act* to know what duties are legally delegable.

**Fractured Root Tips**

Even with solid techniques and procedures, teeth can fracture during routine exodontia, leaving small roots in their sockets. When this occurs, the smallest diameter suction is used to promote visualization. If the tooth had significant mobility prior to fracturing, very fine root-tip elevators can most often elevate the fragments out of the socket. If repeated attempts at elevating prove fruitless, a surgical opening may be performed to gain access to the fragments. When the buccal cortical crestal bone needs to be preserved, a modification of this procedure is performed using a “window” technique. In such cases, a small hole is drilled into the buccal plate next to the root fragment, and a fine instrument is inserted into the hole to push the fragment out of the socket.

The dentist decides whether retrieving a fractured root is in the patient’s best interest. In some cases, the risks of removal outweigh the benefits, for example, root retrieval is forgone when:

- the patient is feeling ill;
- the root fragment is 4mm or less and removal will result in significant trauma to the patient;
- there is no infection or apical pathology associated with the root fragment;
- the root fragment is in close proximity to the mental or inferior alveolar nerve, or to the maxillary sinus; or
- uncontrolled hemorrhage exists.

When the dentist elects to leave a root fragment behind, the patient is informed and reasons why are documented in the patient’s chart. An immediate post-operative radiograph is taken, and follow-up is conducted for the course of one year to determine the fate of the remaining root. The patient is instructed to notify the clinic if any problems related to the retained root tip develop.

**Management of Third Molars**

Extraction of third molars is one of the most common oral surgery procedures performed in U.S. general practices and oral surgery offices. Erupted third molars – also known as “wisdom teeth” – are frequently extracted in general dentistry practices; impacted third molars are typically referred to the oral and maxillofacial surgeon.

Impacted third molars fail to erupt into the dental arch because of interference. Dense overlying bone or thick fibrous tissue may cover the area of eruption, or the angulation of the third molar or position of the adjacent teeth may prevent its eruption. Indications for removing impacted third molars are summarized in Table 1.

**Pericoronitis**

Pericoronitis is a frequent finding in patients presenting with mandibular third molar pain. An infection of the soft tissue surrounding a partially erupted tooth, pericoronitis can result when food debris becomes trapped under the soft tissue flap covering the impacted tooth, preventing proper cleaning of the area when brushing (Figure 28). This allows bacteria (usually *streptococci* and a variety of anaerobic organisms) to invade the site and allow infection to progress. In addition, the
some patients it may undergo cystic degeneration, which causes it to develop into a dentigerous cyst or keratocyst. In general, the diagnosis of a dentigerous cyst is made if the follicular space around the crown of the tooth is greater than 5mm. Similarly, odontogenic tumors can arise from the epithelial cell lining within the dental follicle. As such, screening panoramic radiographs become important in the thorough dental and medical evaluation of the patient.

The lowest morbidity rates associated with third molar removal occurs when teeth are extracted between ages 15 and 25, or when the roots are only two-thirds formed. Removal during these years is the most predictable because the roots are generally straight and not curved, the bone is softer and more pliant, healing is more rapid, and the inferior alveolar nerve is more distant from the root apices, which poses less risk of paralysis. Patients opposing maxillary tooth often causes constant occlusal trauma to the soft tissue overlying the lower unerupted tooth, which results in a swollen, inflamed tissue mass. Referred to as operculitis, this condition can be very painful.

Removal of the overlying soft tissue – the operculum – is a temporary treatment option with limited success that only delays the inevitable surgical extraction.

Pericoronitis can present clinically as a mild infection or as a severe fulminating infection that requires hospitalization and aggressive medical treatment (for example, with intravenous antibiotics and surgical treatment). Patients suffering from pericoronitis usually present with fever greater than 101ºF, malaise, inability to open greater than 20mm, and severe facial swelling.

Mild to moderate acute pericoronitis is best treated by removing the impinging maxillary tooth, followed by irrigation of the inflamed tissue with chlorhexidine solution, 3% hydrogen peroxide, or saline. A prescription for penicillin or clindamycin completes the treatment. Penicillin inhibits bacterial growth of gram-positive bacteria as well as some gram-negative species; clindamycin inhibits bacterial growth of gram-positive bacteria.

Cysts and Tumors
Impacted third molars often are associated with odontogenic cysts and tumors. Screening panoramic radiographs are most helpful in early diagnosis and detection of these conditions. As impacted teeth develop, the surrounding follicular sac usually maintains its original size, but in

Table 1. Indications for Extracting Impacted Third Molars

<table>
<thead>
<tr>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compromised periodontal status of adjacent teeth</td>
</tr>
<tr>
<td>Cyst formation</td>
</tr>
<tr>
<td>Infection</td>
</tr>
<tr>
<td>Interference with orthodontic treatment</td>
</tr>
<tr>
<td>Non-restorable dental caries</td>
</tr>
<tr>
<td>Persistent pain of unknown origin</td>
</tr>
<tr>
<td>Necessary for fabrication of adjacent restorative crowns and dentures</td>
</tr>
<tr>
<td>Preirradiation treatment plan</td>
</tr>
<tr>
<td>Presence of impacted tooth in the line of jaw fracture</td>
</tr>
<tr>
<td>Resorption of adjacent teeth</td>
</tr>
</tbody>
</table>
Because the neurovascular canal (which carries the inferior alveolar nerve bundle) is in close proximity to the apices of the lower third molar teeth, a discussion of lower lip and chin numbness or parasthesia should be conducted. Although the incidence of permanent parasthesia lasting longer than twelve months is only 1%, the patient should be made aware of this as well as other more commonly occurring risks and complications.

Surgical Technique
Sufficient visibility at the surgical site is crucial to good surgical technique. In many offices, the surgical team member may be responsible for moving the light during the procedure.

The #15 scalpel blade is the instrument of choice for use in incising the tissues necessary for third molar extractions. The design for the incision falls into two broad categories: (1) envelope design and (2) triangular flap, which is an envelope design with a vertical-releasing incision. The degree of soft tissue reflection depends on the type of impaction being extracted and the amount of bone removal required. The more difficult the impaction, the more reflection needed. Limiting the flap design helps to decrease postoperative swelling and pain, but it is never done at the expense of compromising the technique or causing trauma to the flap because of decreased visibility.

The incision is made intrasulcularly beginning from the distal of the first molar and extending directly behind the second molar over the bone. Removal of the labial bone using a high-speed surgical handpiece with round or crosscut burs allows exposure of the impacted tooth’s crown up to the cementoenamel junction (CEJ). This makes room for placement of an elevator, which tests the mobility of the tooth. The crown then is usually sectioned either horizontally or vertically, depending upon the angle of the impaction. Finally, a straight elevator is employed to separate the crown from the tooth.

The root tips are delivered with root-tip elevators or with crane picks when there is mobility. When no mobility is realized, additional superior and labial bone is removed so the roots can be sectioned. The bony socket is inspected for any loose debris or bleeding problems and the

with impacted teeth who wait until symptoms occur before seeking extraction have greater procedure-associated morbidity. Early surgical intervention benefits most patients with impacted third molars.

Like all surgical procedures, elective extraction of third molar teeth should not be performed if the possible harm to the patient outweighs the benefits of extraction. Patients with significantly compromised medical conditions are not ideal candidates for elective third molar removal, and most oral and maxillofacial surgeons do not routinely extract asymptomatic third molars in patients over age 50.

Classification of Impacted Third Molars
Impacted third molar teeth can be classified using a number of descriptive terms. The most common classification system compares the impacted tooth’s angulation to the long axis of the adjacent second molar. The mesioangular impaction, in which the third molar is tilted toward the second molar, is the most common type of third-molar impaction. Vertical impaction, in which the long axis of the impacted tooth is parallel to the second molar, is the second most commonly occurring third-molar impaction. In a distoangular impaction, the third-molar crown faces distally or posteriorly. These impactions are the most difficult to extract.

Preoperative Management
All patients scheduled for the removal of impacted third molars should be seen for a consultation visit prior to the surgery. Diagnostic radiographs are taken at this visit (if they are not already available), the medical history is reviewed, and a clinical exam is performed. Clinical teaching aids often are used to review the nature of the surgical procedure and discuss possible intraoperative complications. A decision also is made on the type of anesthetic technique to be used.

Although local anesthesia when used appropriately can provide a complete pain-free experience, many patients require some form of additional intravenous sedation to allow them to calmly endure the surgical removal of multiple impactions. The technique used is determined by the surgeon, but whichever is chosen, intraoperative amnesia should be a preferred end result.

Like all surgical procedures, elective extraction of third molar teeth should not be performed if the possible harm to the patient outweighs the benefits of extraction. Patients with significantly compromised medical conditions are not ideal candidates for elective third molar removal, and most oral and maxillofacial surgeons do not routinely extract asymptomatic third molars in patients over age 50.
Teeth that do not contain amalgam can be safely sterilized using a steam autoclave. Dry heat ovens should never be used. Once they are rendered noninfectious, they can be disposed of as nonregulated waste. Check with the practice setting’s metal recycler to see if the company accepts teeth containing amalgam restorations, and follow the hauler’s instructions for disposal within the clinical setting.

Managing Medical Waste

By their very nature, oral surgery procedures generate regulated wastes and hazardous materials such as extracted teeth, diseased tissues, used needles, and contaminated scalpel blades. The policies for managing these wastes within the dental/oral surgical office are regulated by the Occupational Safety and Health Administration (OSHA) Rule 29 and by individual state regulations (see Appendix B and C for approved OSHA programs and contact information).

Extracted teeth are regulated medical waste. Unless they are treated prior to disposal to render them noninfectious, they must be disposed of in a biohazard bag or container that does not contain contaminated sharps. Contaminated sharps also are regulated medical waste, but most medical waste haulers dispose of sharps containers by incineration. Including extracted teeth that have amalgam restorations in such a container releases harmful mercury vapor into the air when exposed to high temperatures. For the same reasons, teeth containing amalgam restorations must not be heat-processed for sterilization.

Postoperative Surgical Management

Irrigation of the extraction site and soft tissue flap is essential for proper healing. Bone dust and tooth particles that may be present must be rinsed away before the site is sutured. In all routine and surgical extractions (except orthodontic extractions and implant placement), the buccal and lingual plates are compressed with gauze prior to closure. Soft tissue flaps are repositioned and closed with 3-0 or 4-0 resorbable chromic or nonresorbable black silk sutures. Before discharging the patient, hemostasis is checked and written postoperative instructions (Table 2) are provided. The patient also should be informed of common post-extraction sequelae such as facial bruising, swelling and tenderness.

Postoperative Complications

Swelling following surgical extractions is a usual and expected complication. Until proven otherwise, any swelling the patient experiences is considered surgical edema. The symptom may continue to increase for two to three days post-procedure. Ice packs applied externally immediately following surgery for the first 24 hours can help reduce swelling. Postoperative infection, which is usually not a factor until four days after surgery, presents with pain, overlying erythema, fever, lymphadenopathy, and trismus.
**Alveolar Osteitis**
Also known as a dry socket or alveolitis, alveolar osteitis is the most common complication following third molar extractions. Occurring in 3 percent of cases, the dry socket is thought to arise secondary to either a subclinical infection or bone inflammation, resulting in early lysis of the socket blood clot. The empty socket results in bare bone that is very sensitive and painful. Classical complaints include lessening pain that begins to increase in severity three to five days following the procedure. Clinical examination reveals no signs of swelling or infection, except for an extremely painful socket that appears to be empty. Dry sockets are typically found in the mandible and rarely occur in the maxilla.

Treatment is mainly directed at decreasing pain while soft tissue slowly fills the socket over the exposed bone. The alveolus is irrigated with saline solution or sterile water and suctioned dry. Many commercially prepared “dry socket” treatments can be applied directly in the socket, providing significant pain relief immediately thereafter. The alveolus is best irrigated and the dressing changed every 24 to 48 hours, depending on the patient’s pain response. Pain usually lasts four to eight days and resolves without the need for follow-up care. In some states, this expanded duty is delegated to dental team members and should be verified as legally delegable by the state’s Dental Practice Act.

**Bleeding**
Bleeding is expected to occur to a certain degree for the first 24 hours after oral surgery. The patient should be instructed to replace the gauze over the extraction site at 20-to-30 minute intervals. If bleeding persists, the patient should place a dry tea bag over the site and apply firm biting pressure. Tea contains tannins that aid in the clotting of blood. If bleeding continues, an emergency visit for evaluation and treatment may be warranted.

**Edema**
Postoperative swelling of the soft tissue following multiple impaction extractions is common, with peak swelling occurring 48 to 72 hours after the procedure. Patients should be made aware of this consequence prior to the procedure to avoid any unnecessary apprehension. Ice packs applied in 20-minute intervals immediately after surgery and throughout the first 24 hours postoperative can reduce swelling (Note: Ice packs cannot be directly applied to the skin. Instruct the patient or caregiver to wrap the ice pack in a cloth before applying it to the face.). Glucocorticosteroids, administered orally, intravenously, or intramuscular, also can help in decrease swelling following the procedure. In very extensive cases, an additional prescription for an oral steroid medication may be given.

**Maxillary Sinus Involvement**
Maxillary sinus involvement is a risk with any maxillary extraction, but it is a greater risk with maxillary third molars. The risk should be discussed with the patient or guardian prior to surgery. Stubborn maxillary root tips often are left intact rather than risking perforation of the sinus.

**Maxillary Tuberosity Fracture**
Maxillary tuberosity fracture is a complication associated with the extraction of maxillary third
molars. The posterior maxillary tuberosity can fracture when a large portion of the tuberosity is removed along with the tooth. This results in a significant opening of the sinus and makes closure of the alveolus difficult. Surgical extraction of the tooth is considered if no mobility is achieved during luxation. When a tuberosity fracture occurs, the dentist should stop the extraction and leave the fractured segment in place. If the tooth shows no mobility, the patient is placed on a pain medication. After a six-week wait, the tooth is surgically extracted. When a tooth demonstrates considerable mobility, it should be splinted with brackets or wire for six weeks to allow the bone to heal. A surgical extraction then should be completed.

**Nerve Dysfunction**

Nerve Dysfunction is the primary complication associated with mandibular third-molar extractions and the postoperative complication that can be most frustrating to both patient and surgeon alike (Figure 29). Damage to the lingual or inferior alveolar nerve results in an altered sensation called paresthesia or total anesthesia of the lip and tongue. Permanent total anesthesia of the lower lip postoperatively is reported to be about 1 percent, while that of the tongue is one in 1,000 extractions. Most nerves regenerate, and approximately 87 percent of patients with lingual nerve injuries and more than 96 percent of the patients with inferior alveolar injuries recover on their own. Most recovery occurs within nine months. After two years, the likelihood of further recovery is slim. When nerve damage occurs, the extent must be documented in the chart. For the first two months, the patient is followed every two weeks. Thereafter, follow-up visits should occur every six weeks for six months and then every six months for two years.

**Pain**

Pain management is a concern to the dental patient before, during, and after any surgical procedure. At the presurgical consultation, a prescription for an appropriate analgesic is usually given; the patient is advised to fill the prescription prior to the procedure (Filling the prescription before the procedure allows the patient to begin immediate pain therapy while still anesthetized.). Some of the most commonly prescribed analgesics are listed in Table 3.

Patients who begin prescribed pain medication while local anesthesia is still in effect experience milder and less intense pain following treatment. Two basic types of analgesic medications are currently on the market: those that act peripherally by interfering with prostaglandin synthesis (aspirin, acetaminophen, ibuprofen, and nonsteroidal anti-inflammatory ingredients), and the narcotic medications that act on the central nervous system. Narcotic medications are formulated with aspirin, acetaminophen, or nonsteroidal anti-inflammatory medication. Aspirin-based compounds can decrease platelet aggregation, and as such often are not used postoperatively. The first two days following molar surgery are the most painful (unless alveolitis develops), and pain decreases in intensity from that point onward.

**Trismus**

Trismus – the inability to open one’s mouth maximally – commonly occurs following any extraction, especially mandibular third-molar extractions. This condition is most often the result of inflammation of the masticating muscles secondary to the surgical procedure. Multiple injections of local anesthesia, especially the inferior alveolar block, also may contribute to trismus. Treatment of this common condition includes reassurance, softer diet, alternating hot and cold compresses to the face, nonsteroidal anti-inflammatory medication, and possibly antibiotics. For prolonged or worsening cases of trismus, evaluation of the pharyngeal space for possible infection is warranted.
Conclusion

This course has presented the basics of oral surgery methodology and instrumentation. It has reviewed management of third molar surgeries, postoperative management of the surgical patient, and possible complications following treatment. Whether assisting in a general dental practice or a specialty clinic, surgical dental team members are encouraged to obtain further education and proper training to ensure that they are fully prepared to assist both the dentist and the patients they treat.

<table>
<thead>
<tr>
<th>Drug Name</th>
<th>Dosage</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lortab (liquid)</td>
<td>Hydrocodone and acetaminophen elixir 7.5mg/500mg per 15 ml</td>
<td>q6h</td>
</tr>
<tr>
<td>Motrin</td>
<td>600mg ibuprofen</td>
<td>q6h</td>
</tr>
<tr>
<td>Tylenol No. 3</td>
<td>Codeine 30 mg and 300 mg acetaminophen</td>
<td>q4h-q6h</td>
</tr>
<tr>
<td>Percocet</td>
<td>Oxycodone 5mg and 325 mg acetaminophen</td>
<td>q6h</td>
</tr>
<tr>
<td>Percodan</td>
<td>Oxycodone 5mg and 325 mg aspirin</td>
<td>q6h</td>
</tr>
<tr>
<td>Vicon</td>
<td>Hydrocodone 5 mg and 500 mg acetaminophen</td>
<td>q6h</td>
</tr>
<tr>
<td>Vicon ES</td>
<td>Hydrocodone 7.5 mg and 500 mg acetaminophen</td>
<td>q6h</td>
</tr>
<tr>
<td>Vicoprofen</td>
<td>Hydrocodone 7.5 mg and 200 mg ibuprofen</td>
<td>q6h</td>
</tr>
</tbody>
</table>
**Appendix A:**

**Basic Instruments for Third Molar Surgery**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheek retraction</td>
<td>Mouth mirror</td>
</tr>
<tr>
<td>Visualization of the surgical area</td>
<td>Wide retractor (Seldin #23, Minnesota)</td>
</tr>
<tr>
<td>Incisions</td>
<td>Scalpel handle with #15 beak</td>
</tr>
<tr>
<td>Flap development and reflection</td>
<td>#9 periosteal elevator, Woodson, Molt</td>
</tr>
<tr>
<td>Flap retraction</td>
<td>Wide retractor (Seldin #23, Minnesota)</td>
</tr>
<tr>
<td>Bone removal</td>
<td>Handpieces:</td>
</tr>
<tr>
<td></td>
<td>• high speed surgical handpiece (no air blown into surgical field)</td>
</tr>
<tr>
<td></td>
<td>• Two-speed straight handpiece (using the higher speed)</td>
</tr>
<tr>
<td></td>
<td>• Surgical straight handpiece (preferred by many oral surgeons)</td>
</tr>
<tr>
<td></td>
<td>Burs:</td>
</tr>
<tr>
<td></td>
<td>• Crosscut tapered fissure (702, 558)</td>
</tr>
<tr>
<td></td>
<td>• Non tapered crosscut fissure</td>
</tr>
<tr>
<td></td>
<td>• Round (high speed burs should be surgical length)</td>
</tr>
<tr>
<td>Luxation and sectioning</td>
<td>Straight elevators such as the 301, and 34 or 34S and Cryer (East-West) elevators</td>
</tr>
<tr>
<td>Tooth extraction</td>
<td>Forceps such as 150 and 151</td>
</tr>
<tr>
<td>Suture cutting, distal wedge excision, severing fibrotic tissue</td>
<td>Surgical scissors, such as Dean</td>
</tr>
<tr>
<td>Tying sutures, traction on follicle, removing loose pieces of tooth</td>
<td>Needle holder, such as Mayo-Hegar 6”</td>
</tr>
<tr>
<td>Suturing</td>
<td>4-0 or 3-0 silk or chromic gut suture with 3/8 circle reverse cutting needle</td>
</tr>
<tr>
<td>Curetting follicle or infection</td>
<td>Surgical spoon curette</td>
</tr>
<tr>
<td>Suctioning</td>
<td>Surgical suction tip, tapered</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Device:</td>
</tr>
<tr>
<td></td>
<td>• Through the handpiece or with three-way syringe (medium from a reservoir)</td>
</tr>
<tr>
<td></td>
<td>• 15-30 ml irrigation syringe with blunt irrigation needle</td>
</tr>
<tr>
<td></td>
<td>• Bulb syringe, or plastic molded irrigation syringe</td>
</tr>
<tr>
<td></td>
<td>Medium:</td>
</tr>
<tr>
<td></td>
<td>• Sterile saline or sterile water</td>
</tr>
</tbody>
</table>
## Appendix B:

### Resources for Regional OSHA Offices

<table>
<thead>
<tr>
<th>Region</th>
<th>Contact Information</th>
<th>States Covered in Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Regional Office</td>
<td>Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont</td>
</tr>
<tr>
<td></td>
<td>JPX Federal Building, Room E340 Boston, Massachusetts 02203 (617) 355-9860 (617) 355-9827 FAX <a href="http://www.osha.gov/oshdr/r01.html">http://www.osha.gov/oshdr/r01.html</a></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Regional Office</td>
<td>New Jersey, New York, Puerto Rico, Virgin Islands</td>
</tr>
<tr>
<td></td>
<td>201 Varick Street, Room 670 New York, New York 10014 (212) 337-2378 (212) 337-2371 FAX <a href="http://www.osha.gov/oshdr/r02.html">http://www.osha.gov/oshdr/r02.html</a></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Regional Office</td>
<td>District of Columbia, Delaware, Maryland, Pennsylvania, Virginia, West Virginia</td>
</tr>
<tr>
<td>IV</td>
<td>Regional Office</td>
<td>Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee</td>
</tr>
<tr>
<td></td>
<td>61 Forsyth Street, SW Room 6150 Atlanta, Georgia 30303 (404) 552-2300 (404) 552-2295 FAX <a href="http://www.osha.gov/oshdr/r04.html">http://www.osha.gov/oshdr/r04.html</a></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Regional Office</td>
<td>Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin</td>
</tr>
<tr>
<td></td>
<td>230 South Dearborn Street, Room 3244 Chicago, Illinois 60604 (312) 353-2220 (312) 353-7774 FAX <a href="http://www.osha.gov/oshdr/r05.html">http://www.osha.gov/oshdr/r05.html</a></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Regional Office</td>
<td>Arkansas, Louisiana, New Mexico, Oklahoma, Texas</td>
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<tr>
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<td>525 Griffin Street, Suite 602 Dallas, Texas 75202 (972) 850-4145 (972) 850-4149 FAX (972) 850-4150 FSO FAX <a href="http://www.osha.gov/oshdr/r06.html">http://www.osha.gov/oshdr/r06.html</a></td>
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<tr>
<td>VII</td>
<td>Regional Office</td>
<td>Kansas, Missouri, Nebraska, Iowa</td>
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<td>Two Pershing Square Building 2300 Main Street, Suite 1010 Kansas City, Missouri 64108-2416 (816) 283-8745 (816) 283-0547 FAX <a href="http://www.osha.gov/oshdr/r07.html">http://www.osha.gov/oshdr/r07.html</a></td>
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<tr>
<td>VIII</td>
<td>Regional Office</td>
<td>Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming</td>
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<tr>
<td>IX</td>
<td>Regional Office</td>
<td>Arizona, California, Guam, Hawaii, Nevada</td>
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<td>IX Federal Contact Numbers 90 7th Street, Suite 18100 San Francisco, California 94103 (415) 625-2547 (800) 475-4020 (For Complaints - Accidents/Fatalities) <a href="http://www.osha.gov/oshdr/r09.html">http://www.osha.gov/oshdr/r09.html</a></td>
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<tr>
<td>X</td>
<td>Regional Office</td>
<td>Alaska, Idaho, Oregon, Washington</td>
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Appendix C:

<table>
<thead>
<tr>
<th>States/Territories with OSHA Approved Programs</th>
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<tbody>
<tr>
<td>Alaska (Juneau)</td>
</tr>
<tr>
<td>(907) 465-2700</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/alaska.html</td>
</tr>
<tr>
<td>New Mexico (Santa Fe)</td>
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<tr>
<td>(505) 827-2850</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/new_mexico.html</td>
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<tr>
<td>Arizona (Phoenix)</td>
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<tr>
<td>(602) 542-5795</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/arizona.html</td>
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<tr>
<td>New York (Albany)</td>
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<tr>
<td>(518) 457-2741</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/new_york.html</td>
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<tr>
<td>California (San Francisco)</td>
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<tr>
<td>(415) 703-5050</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/california.html</td>
</tr>
<tr>
<td>North Carolina (Raleigh)</td>
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<tr>
<td>(919) 897-2900</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/north_carolina.html</td>
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<tr>
<td>Connecticut (Wetherfield)</td>
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<tr>
<td>(203) 566-5123</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/ CONNECTicut.html</td>
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<tr>
<td>Oregon (Salem)</td>
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<tr>
<td>(503) 378-3272</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/oroegon.html</td>
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<tr>
<td>Hawaii (Honolulu)</td>
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<tr>
<td>(808) 586-9116</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/hawaii.html</td>
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<tr>
<td>Puerto Rico (Hato Rey)</td>
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<tr>
<td>(787) 754-2119</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/puerto_rico.html</td>
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<tr>
<td>Illinois</td>
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<tr>
<td>(217) 782-6206</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/illinois.html</td>
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<tr>
<td>South Carolina (Columbia)</td>
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<tr>
<td>(803) 896-4300</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/south_carolina.html</td>
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<tr>
<td>Indiana (Indianapolis)</td>
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<tr>
<td>(317) 232-2678</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/indiana.html</td>
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<tr>
<td>Tennessee (Nashville)</td>
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<tr>
<td>(615) 741-2793</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/tennessee.html</td>
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<tr>
<td>Iowa (Des Moines)</td>
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<tr>
<td>(515) 281-6432</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/iowa.html</td>
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<tr>
<td>Utah (Salt Lake City)</td>
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<tr>
<td>(801) 530-6901</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/utah.html</td>
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<tr>
<td>Kentucky (Frankfort)</td>
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<tr>
<td>(502) 564-3070</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/kentucky.html</td>
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<tr>
<td>Vermont (Montpelier)</td>
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<tr>
<td>(802) 828-5098</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/vermont.html</td>
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<tr>
<td>Maryland (Baltimore)</td>
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<tr>
<td>(410) 767-2241</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/maryland.html</td>
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<tr>
<td>Virgin Islands (St. Croix)</td>
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<tr>
<td>(340) 773-1994</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/virgin_islands.html</td>
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<tr>
<td>Michigan (Lansing)</td>
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<tr>
<td>(517) 322-1814</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/michigan.html</td>
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<tr>
<td>Virginia (Richmond)</td>
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<tr>
<td>(804) 786-2377</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/virginia.html</td>
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<tr>
<td>Minnesota (St. Paul)</td>
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<tr>
<td>(651) 284-5010</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/minnesota.html</td>
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<tr>
<td>Washington (Olympia)</td>
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<tr>
<td>(360) 902-4200</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/washington.html</td>
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<tr>
<td>Nevada (Carson City)</td>
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<tr>
<td>(775) 684-7260</td>
</tr>
<tr>
<td>osha.gov/dcsp/osp/stateprogs/nevada.html</td>
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<tr>
<td>Wyoming (Cheyenne)</td>
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<tr>
<td>(307) 777-7159</td>
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<tr>
<td>osha.gov/dcsp/osp/stateprogs/wyoming.html</td>
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Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to www.dentalcare.com and find this course in the Continuing Education section.

1. Indication for third molar extraction includes _______________.
   a. cyst prevention
   b. failed endodontic treatment
   c. restorable dental caries
   d. persistent pain of unknown origin

2. Peak swelling in edema cases occurs _______________.
   a. immediately
   b. in 20 to 24 hours
   c. in 24 to 48 hours
   d. in 48 to 72 hours

3. In the distoangular impaction, the crown faces ____________ and is ____________ to extract.
   a. superiorly / easiest
   b. posteriorly / easiest
   c. posteriorly / difficult
   d. superiorly / difficult

4. A diagnosis of a dentigerous cyst can be made if the follicular space around the crown of the tooth is greater than ___________.
   a. 3 mm
   b. 5 mm
   c. 7 mm
   d. 9 mm

5. A frequent finding in patients presenting with mandibular third molar pain is a clinical condition referred to as _______________.
   a. osteomyelitis
   b. pericoronitis
   c. periodontitis
   d. alveolar osteitis

   a. gram-negative / gram-positive and some gram-negative
   b. gram-positive / gram-positive and some gram-negative
   c. gram-positive and some gram-negative / gram positive
   d. gram-positive and some gram-negative / gram-negative

7. Polygalactic and polyglycolic acid sutures may take up to ____________ to resorb.
   a. 9 to 14 days
   b. 1 week
   c. 15-21 days
   d. 4 weeks
8. Alveolar osteitis is also known as a ___________.  
   a. dry socket  
   b. dentigenic tumor  
   c. keratocyst  
   d. bone cancer  

9. For mandibular procedures, the chair should be positioned so that the occlusal plane is _____________ to the floor.  
   a. 30 to 45 degrees  
   b. 60 to 90 degrees  
   c. parallel  
   d. perpendicular  

10. Alveolar osteitis occurs in ______ percent of the cases and presents in ____________ days following the procedure.  
    a. 3 / three to five  
    b. 3 / four to eight  
    c. 1 / three to five  
    d. 1 / four to eight  

11. Permanent anesthesia postoperatively of the lower lip is reported to be about ______ percent.  
    a. 96  
    b. 87  
    c. 20  
    d. 1  

12. The handles of mandibular molar forceps are set ____________ to the beaks.  
    a. 45 degrees  
    b. 60 degrees  
    c. 90 degrees  
    d. parallel  

13. The patient’s white blood cell count should be at least ________/mm$^2$ with a platelet count of ________/mm$^2$ before undergoing routine procedures.  
    a. 50,000 / 2,000  
    b. 25,000 / 1,000  
    c. 1,000 / 25,000  
    d. 2,000 / 50,000  

14. Extractions are typically performed __________ weeks before starting radiotherapy.  
    a. two  
    b. three  
    c. four  
    d. six  

15. A cellulitis is an erythematous swelling resulting in the spread of __________ through the __________ tissue planes.  
    a. exudate / soft  
    b. exudate / hard  
    c. microorganisms / soft  
    d. microorganisms / hard
16. Plain gut sutures retain their strength for approximately __________ days.
   a. 3 to 5
   b. 5 to 7
   c. 9 to 14
   d. 15 to 21

17. Two methods of tooth removal include _________________.
   a. forceps and elevator instrumentation
   b. dissection and retrieval
   c. forceps/elevator instrumentation and sectioning
   d. retrieval and forceps instrumentation

18. The universal forceps #151 is commonly used for extracting _________________.
   a. maxillary anteriors
   b. maxillary molars
   c. mandibular molars
   d. maxillary premolars

19. Surgical instruments are typically made of _________________.
   a. aluminum
   b. copper
   c. stainless chromium
   d. stainless steel

20. A #88 L forceps would be used to extract a _________________.
   a. mandibular right molar
   b. mandibular left molar
   c. maxillary right molar
   d. maxillary left molar

21. A double-edged scalpel blade is designated by the ____________.
   a. number 12
   b. number 15
   c. letter B
   d. letter D

22. For maxillary procedures using a surgical table, the head is positioned with the maxillary arch ____________ to the floor.
   a. parallel
   b. perpendicular
   c. 30-45 degrees
   d. 60-90 degrees

23. The __________ blade is the instrument of choice for use in incising the tissues necessary for third-molar extractions.
   a. #11
   b. #12
   c. #15
   d. #20
24. The management of regulated waste and hazardous materials within the dental office is covered under regulatory policies of the __________.
   a. OSAP
   b. CDC
   c. ADA
   d. OSHA

25. The mucogingival line marks the junction between the ___________ and the ____________.
   a. attached gingiva / alveolar mucosa
   b. alveolar bone / attached gingiva
   c. keratinized tissue / loose connective tissue
   d. alveolar bone / loose connective tissue

26. The #65 forceps is typically used for removing ____________.
   a. canines
   b. premolars
   c. molars
   d. root tips

27. When extracting multiple teeth, the ____________ teeth are generally extracted first as the onset of local anesthesia is usually ____________ than the opposite arch.
   a. mandibular / quicker
   b. mandibular / slower
   c. maxillary / slower
   d. maxillary / quicker

28. The gingiva is attached to underlying calcified tooth structure by a specialized layer of cells referred to as the ____________ epithelium.
   a. alveolar
   b. mucogingival
   c. junctional
   d. keratinized

29. To make the envelope flap, the dentist uses a ____________ to incise the fibers around the involved tooth.
   a. scalpel
   b. handpiece
   c. bone rongeur
   d. chisel

30. Chromic-treated catgut sutures will retain their strength for ____________ days.
   a. 3 to 5
   b. 5 to 7
   c. 9 to 14
   d. 15 to 21
References


About the Author

Natalie Kaweckyj, LDARF, CDA, CDPMA, COA, COMSA, MADAA, BA

Natalie Kaweckyj currently resides in Minneapolis, MN where she has worked clinically, administratively and academically. She is currently clinic manager at Children’s Dental Services. She is a certified dental assistant, certified dental practice management administrator, certified orthodontic assistant, certified oral and maxillofacial surgery assistant, licensed dental assistant in restorative functions in Minnesota, and a Master of the American Dental Assistants Association. She graduated from the ADA accredited dental assisting program at ConCorde Career Institute in 1993, and became a member of ADAA that same year.

She has graduated with degrees in biology and psychology and is pursuing a Master’s in Public Health with a focus on oral health education. Natalie is a three-term past president of MDAA, past 7th District Trustee and has served as chair of many ADAA Councils and Subcommittees. She has served in all offices of the ADAA including President and is a past director of the ADAA Foundation. In addition to her association duties, Natalie is very involved with her state board of dentistry and state legislature in the expansion of the dental assisting profession, serves as the Immediate President of the Minnesota Educators of Dental Assistants (MEDA) and sits on the MN RDA Exam Committee in Expanded Functions. She is also affiliated with OSAP and the American Association of Dental Practice Managers. She has authored several other courses for the ADAA on a variety of subjects and speaks locally and regionally.

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